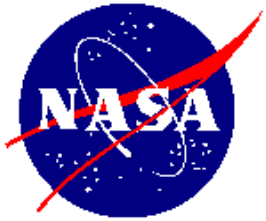# Challenging Assumptions
(The Role of Healthy Skepticism
In NASA Program Management)

PM Challenge 2008

Bryan O'Connor
Chief, NASA Safety and Mission Assurance
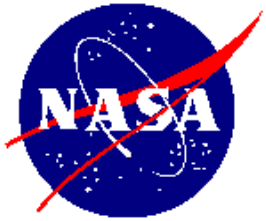
Safety Quote of the Day

Life moves pretty fast, if you don't stop and look around once in a while, you might miss it.

Ferris Bueller

Common Theme: *Not enough "why?"*

- **Mishap investigations:** *board did not get to root cause*

- **Failure investigations:** *team found proximate cause, changed out bad hardware, but stopped short of knowledge needed to prevent future recurrence*

- **Operational anomaly investigations:** *used dated models for critical decisions…no time to revalidate*

- **Option trades:** *compared apples to oranges without question*

- **Design studies:** *invoked historical data without caveats or context*

- **Risk studies:** *treated numbers like absolutes…no discussion of assumptions, limitations or uncertainties*
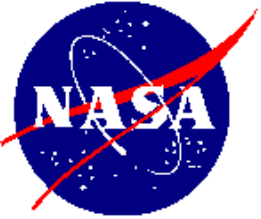
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Skepticism as a Cultural Habit

There is no harm in doubt and skepticism, for it is through these that new discoveries are made

Richard Feynman

Healthy Skepticism…(Core Values)

- **Skepticism leads to a *healthy result***
  - **Mission objectives are accomplished**
  - **Team can go home to their families intact *(Safety)***
  - **Taxpayers are served as they deserve *(Integrity)***

- **Healthy skepticism enables a *healthy environment***
  - **Professional *(Excellence)***
  - **Respectful *(Teamwork, Integrity)***
  - **Communications *(Safety, Teamwork)***
  - **"Safety culture" *(Safety, Teamwork, Excellence)***
  - **"Learning organization" *(Excellence)***
  - **"Engineering curiosity" *(Excellence)***
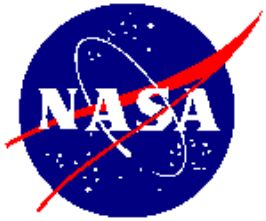
Cynicism vs. Skepticism

The skeptic doesn't trust the analysis…
the cynic doesn't trust the analyst

Today's Briefer

A cynic is not merely one who reads bitter lessons
from the past, he is one who is prematurely
disappointed in the future

Sidney J. Harris

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What We Need on Our Team

Optimistic Pessimists

or maybe

Pessimistic Optimists

who are

Fearless Communicators

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Common Communications Barriers

- **Language (literal and figurative)**
- **Technology (not enough…too much)**
- **Regulatory Limits (security, export control, privacy, etc)**
- **Volume (wheat and chaff)**
- **Human Limitations (pride, forgetfulness, *cynicism*, fear, communication skills)**
- **Organizational Competitiveness (knowledge is power)**
- **Time: *"who has time to go over the lessons learned?"***

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Lessons Learned: Why Bother?

No one wants to learn by mistakes, but we cannot learn enough from successes to go beyond the state of the art.

Henry Petrosky

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The System Must Support the Skeptics

- **Good: ops team questioned LCC rationale**

- **Bad: absent right rationale, ops team manufactured wrong rationale**

- **Mishap Board recommended team training and updating LCCs**

- **Corrective action plan called for inserting rationale next to LCCs**

- **JSC Mission Ops follow up: insert rationale with flight rules for real time access**

Examples of Healthy Skepticism

- Ask the risk analyst to present uncertainties

- Ask for verification of a catastrophic hazard control

- Take the time to read draft change board minutes

- Ask Engineering to review assumptions inherent in rarely used damage model before the mission

- Challenge the rationale for an unusual test request

- Ask "why" one more time after the analyst proposes "root cause"

- Ask that rationale be readily available for all new requirements

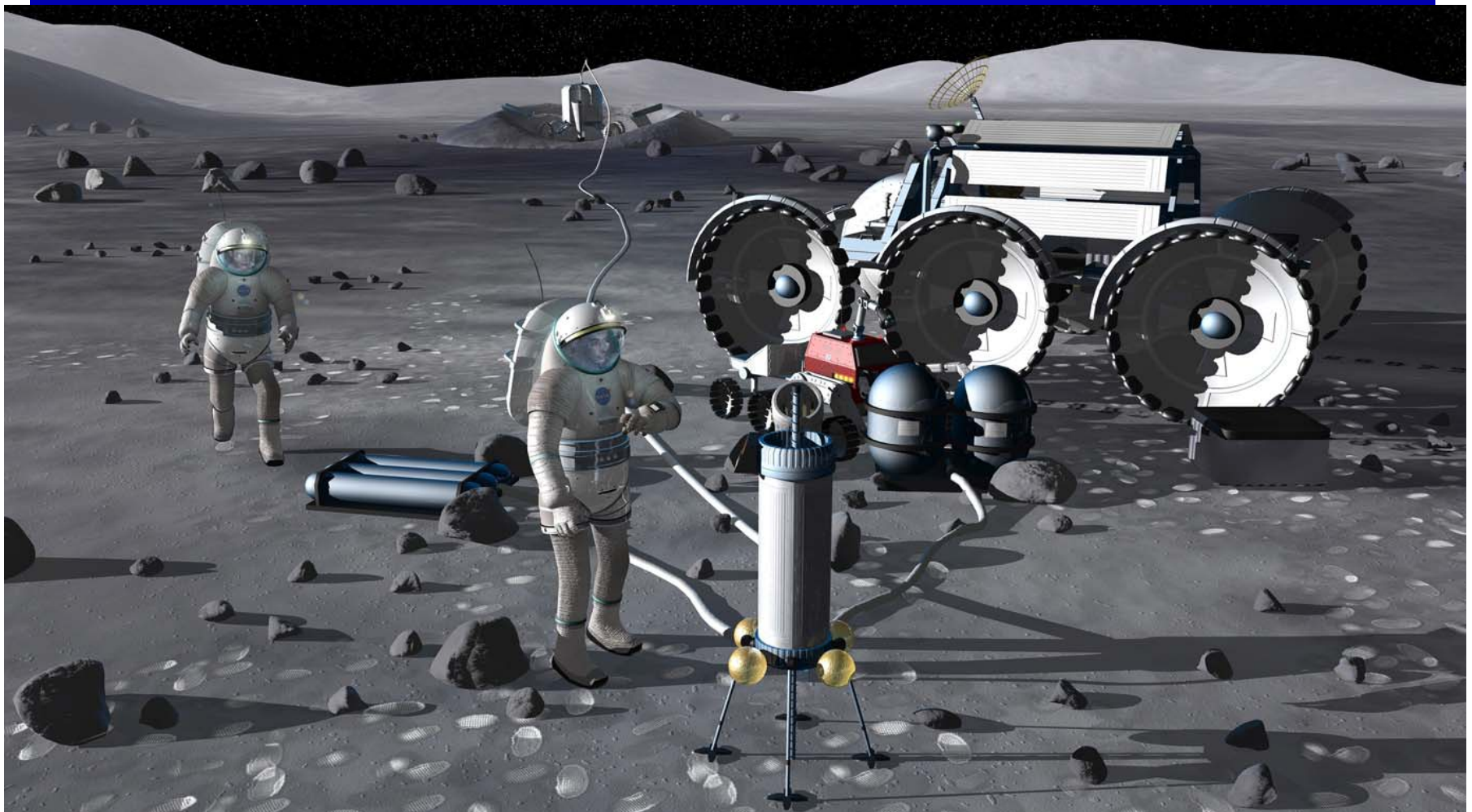*Be skeptical of this rationale: "Because that's the way we always do it"*

GITTERDUNN…

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